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Environmental Sciences Studies of the Physicochemical Parameters of soil samples of Khed Taluka Dist: Pune (Maharashtra)

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ABSTRACT

The term "soil testing" refers to the full range of chemical, physical and biological tests that may be carried out on a submitted sample of soil, though in the present context, only nutritional aspects will be considered. Assessment of land capability for various forms of agriculture, In the present investigation the physicochemical study of soil is based on various parameters like total Organic Carbon, Nitrogen (N), Phosphorus (P_2O_5), Potassium (K_2O), pH and Conductivity. To study the effect of phosphate fertilizer, phosphorus, and application of nitrogen to increase percentage yield of crops . This information will help farmers to decide the problems related to soil nutrients amount of fertilizers to be added to soil to make production economic.

Keywords: Quality of soil, Soil test, EC, PH, Total organic carbon Nitrogen (N), phosphorus (P) and potassium (K).

INTRODUCTION

Soil is a non-renewable resource upon which mankind depends for survival. Historically, the rise of great civilizations has been linked to the quality of soil and the availability of water. Equally, the demise of such civilizations is often attributed to mismanagement of soil and land in its broadest sense. Crop productivity and soil fertility are thus synonymous.

Yields have to be increased from existing land areas; adding fertility to the soil to satisfy the demands of higher-yielding crops is essential. Soils vary greatly throughout the world; they have inherent weakness, primarily deficiencies in nutrients that are essential to growing crops Tests are usually performed to measure fertility and indicate deficiencies that need to be remedied Soil testing can be divided into four steps (1) sampling, (2) analysis, (3) interpretation, and (4) recommendations. Most soils are deficient in nitrogen (N); it is transient in nature, and plants need a lot of it. In many cases, phosphorus (P) is just as critical; soil chemical reactions reduce the effectiveness of P fertilizers. The soils are generally well supplied with potassium (K), and usually don't need fertilization, especially for low-yielding rainfed crops. In recent years, there is a growing realization has grown that other elements, e.g., micronutrients, are deficient in some areas of the region.

METHODOLOGY

Size of Area to Sample:
Traditional Methods:
The size of the area from which a sample is taken may vary from less than one acre (for example, lawns, gardens, etc.) to 15 acres. For most field conditions the size may range from 5 to not more than 15 acres. Variations in soil types, slope, drainage, or past management may require that smaller areas be sampled, resulting in three or more composite samples per field.

Precision Agriculture Methods:
Precision farming uses the modern tools of Global Positioning Systems (GPS), Geographic Information Systems (GIS), and remote sensing to delineate subsections of fields that can be sampled separately. The division of field areas that can be sampled separately is typically based on soil type, field topography, or crop growth or yield maps from the previous season. Although areas of poor crop growth may be due to factors other than plant nutrition, sampling these areas separately helps to determine if lack of fertility may be reducing crop yield

Physico-Chemical Analysis:
The collected samples were analysed for major Physicaland Chemical soil parameter Like pH, Elecrical Conductivity(EC), Organic Carbon (OC), Nitrogen(N), Phosphorus(P), Potassium(K). Organic matter is oxidized with chromic acid(Potassium Dichromate, Sulphuric acid) This method is widely used in Indian laboratories. The K and P analysis by standard methods.

PH was measured using PH meter, EC was measured using a Conductivity meter, OC was measured using colorimeter, Potassium was measured using Flame photometer, Phosphorus was measured using Spectrophotometer. All apparatus are Systronic make. Examination of soil done by Government of Maharashtra Horticulture Training Centre, Talegaon Dabhade, Dist-Pune

RESULTS AND DISCUSSION

Total 10 villages soil samples of Khed Taluka, Dist : Pune were collected in clean polythene bags and brought to the Laboratory it is the permissible standard according to Horticulture Training Centre,. Air dry the soil samples in shade, crush the soil clods lightly and grind with the help of pestle and mortar, pass the entire quantity through 2mm stainless steal sieve, if the gravel content is substantial record as percent of the sample (w/w) as to pass it through 0.2 to 0.5 mm sieves, processing of the samples for analysis.

Determination of Soil
(1) Soil Temperature :-
Soil temperature is one of the most important soil properties that effect crop growth. The major source of heat is sun and heat generated by the chemical and biological activity of the soil is negligible.

(2) PH :-
The soil reaction or PH is meant to express the acidity or alkalinity of the soil. The PH is very important property of the soil is it determines the capacity. The PH values fluctuated less than 8.5(table-1). The limit of PH value for soil Acidic. < 6.5, Normal 6.5-7.8, Alkaline 7.8- 8.5, Alkali > 8.5.

(3) EC:-

Total soluble salts are estimated from electrical conductivity (EC) of aqueous soil extracts. Standard value of EC in soil- Normal < 0.8 dsm-1, critical for salt sensitive crops, critical for salt tolerant crops 1.6 - 2.5 dsm-1, Injurious to most crops > 2.5 dsm-1. The EC value 04 to 1.8 (table no.1)

(4) OC and Nitrogen (N) :-

Soil organic carbon is the seat of nitrogen in soil and its determination is often carried out as an index of nitrogen availability. In the colorimeter method (Datta et al, 1962), Organic matter is oxidized with chromic acid. OC in Khed taluka 0.23 to 0.85 (table no.1) .Standard value of OC low < 0.50, medium 0.50- 0.75 and high > 0.75.

(5) Phosphorus:-

Phosphorus was found in the range of low, medium, high (table no.1). Inorganic phosphorus as orthophosphate plays a dynamic role in aquatic ecosystem. Phosphorus, the most important micro nutrient, is utilized by plant in the form of $H_2PO_4^-$ & HPO_4^{2-} species.

6)Potassium:

Standard value of K as K2O in soil low < 140 kg K2O ha-1, medium 140-280 kg K2O ha-1high > 280 kg K2O ha-1. Potassium was found in the range of low, medium, high (table no.1). K though present in small amount in soil sample, plays a vital role in the metabolism of fresh water and considered to be an important micronutrient. The K is relatively abundant in the earth's crust, most of it is not accessible to plant.

Experimental value of quality characteristic especially PH, EC, OC, N, P, K, of soil of Khed Taluka are present in the table no. 1. Result are in tune with farming practices followed by farmers of this region. Most of the farmer's are using chemical fertilizer, Urea and Nitrogen fertilizer only since last 25 to 30 years which contains concentrated amount of Nitrogen, OC & Phosphorus. On the basis of these results farmers are advised to use integrated nutrient management practice to maintain optimum concentration of all the essential nutrients for plants. Farmers are also advised to add bio-fertilizers containing organic carbon and nitrogen solubilizing bacteria.

Table 1: Experimental value of quality characteristic especially PH, EC, OC, N, P, K, of soil of Khed Taluka

Sample No.	pH	E.C.	Organic Carbon	N	P	K
01	7.25	0.16	0.84	412.00	20.02	323.40
02	8.10	0.14	1.02	460.14	16.24	342.12
03	7.72	0.12	0.72	354.24	24.12	424.24
04	7.90	0.18	0.64	314.14	20.28	404.12
05	7.48	0.21	0.92	448.46	16.42	332.54
06	8.16	0.24	0.68	454.18	20.26	428.00
07	8.24	0.18	0.82	308.84	24.34	421.32
08	7.80	0.20	1.04	364.14	26.02	522.24
09	7.68	0.22	0.68	452.42	24.84	548.64
10	8.05	0.16	0.82	404.16	18.64	424.32
11	8.26	0.20	0.74	514.34	22.62	436.74
12	7.54	0.24	0.92	426.34	28.34	483.50

EC- mS/cm.   C- org-%,   N,P& K- Kg/hectre,

1) The physico-chemical analysis of the soil samples from western villages have influence of the uncontrolled solid waste disposal practice. The main crops are potato, onion and groundnut.
2) Most of the farmers are using excessive chemical fertilizers and the too much dose of such fertilizers in few soils has rendered high values of P and K. The retention of K could also be due the clay minerals formed by chemical weathering of basalts which is the parent material for the soil.
3) Use of acidic fertilizers and organic manure can be a remedy which can raise the crop yield.
4) Monitoring of micronutrients in the soils should be done periodically as it can be an efficient way to assess the qualitative and quantitative abundances of the metal concentrations.

An examination of soil samples (Table 1) shows that the values for pH range from 7.25 to 8.26 indicating that the soils are alkaline and under such conditions the solubility of minerals decreases creating nutrient deficiencies in the soils. Plant growth is therefore limited by deficiencies in iron, manganese, zinc, copper and boron. Electrical Conductivity value ranges from 0.12 mS/cm to 0.24mS/cm. However some samples shows excess content of soluble salts which may due to excess use of fertilizer like P and K. Electrical conductivity is used to estimate the soluble salt concentrations in soil and is commonly used as a measure of salinity. Soil with EC below 0.4mS/cm are considered marginally or non-saline, while soils above 0.8 mS/cm are considered severely saline. The organic carbon (%) ranges from 0.64 to 1.04 % .The organic soil matter includes all the dead plant materials and live or dead animals. Most living things in soils, including plants, insects, bacteria and fungi, are dependent on organic matter for nutrients and energy. Soils have varying organic compounds in varying degrees of decomposition. Organic matter holds soils open, allowing the infiltration of air and water, and may hold as much as twice its weight in water. Phosphorus is one of the key macronutrient required for plant growth and metabolism. Inorganic phosphate supplied to the soil as a fertilizer is rapidly converted into unavailable form. Soluble P converted into insoluble phosphate involves microorganisms. Phosphorous in the present soils vary from 16.24 Kg/hectare to 28.34 Kg/hectare.The highest value in sample may be due to use of excessive phosphorous fertilizers. Application of phosphorus (P) is necessary for maintaining a balance between the other plant nutrients and ensuring the normal growth of the crop.Potassium fixation occurs when soils dry and the potassium is bonded between layers of clay. Under certain conditions, dependent on the soil texture, intensity of drying, and initial amount of exchangeable potassium. From the analyzed samples potassium ranges from 323.40 Kg/hectare to 548.64 Kg/hectare, indicating sufficient K in most of the sample.

Its activities has many enzyme reaction involved in the metabolism of organic acids P and N it is also involved in the photosynthesis and protein synthesis and also, manganese function along with Fe (Lindsay and Norvell, 1978) in formation of chlorophyll. Showing the variation in different parameter of soil samples from Eastern and Western region of Khed taluka

CONCLUSION

This can be concluded from this study that the available EC, PH, OC N, P, K, deficient soil is recommended rich fertilizer. To predict the probable crop response to applied nutrients. To identify the type and degree of soil related problems like salinity, alkalinity and acidity etc. and to suggest appropriate reclamation / amelioration measure. To find out suitability for growing crops.To find out suitability for irrigation.To study the soil genesis. The soil sample studied area of Khed Taluka. Dist : Pune has been found to be fit for crop productivity.

Conflicts of interest: The authors stated that no conflicts of interest.

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